more than twenty years ago, have been utilised by Mr. H. S. Davis for the determination of the parallax (*Astronomical Journal*, No. 343). Six pairs of comparison stars were employed, and the combined results give the value $0''\cdot465 \pm 0\cdot044$, corresponding approximately to a distance of η Cassiopeiæ from the earth of 43,113,000,000,000 miles, or $7\frac{1}{3}$ light years. Though the new value exceeds previous ones, it is not considered improbably large if the Rutherford plates are subject to no systematic error. Using Grüber's values of the orbital elements, the combined masses of the components is two-tenths as great as that of the sun, and the distance between the components 19 astronomical units, the relative orbit thus being about the same size as that of Uranus. These numbers, however, may require some modification, as Dr. See has recomputed the elements of the orbit, with the results slightly differing from those adopted by Mr. Davis. Dr. See states that during the next ten years the position angle will increase from 204° to 251°, while the distance will diminish from $4''\cdot52$ to $3''\cdot33$.

A BELGIAN ASTRONOMICAL SOCIETY.—A Société Belge d'Astronomy has been founded at Brussels. The object of the Society is to popularise astronomy and the sciences connected with it (geodesy, meteorology, terrestrial physics, &c.), and to encourage research into the domains of those branches of knowledge. The President of the Society is M. F. Jacobs, and among the Council are General Tilly, Prof. Dusausoy, Prof. Goemans, M. Lagrange, Prof. Pasquier, Prof. Rousseau, and M. Terby. Two of the Secretaries are M. Stroobaut and M. Vincent, both observers at the Royal Observatory, Brussels.

THE IRON AND STEEL INSTITUTE.

THE annual spring meeting of the Iron and Steel Institute was held on Thursday and Friday of last week, in the theatre of the Society of Arts, under the chairmanship of the new President, Mr. David Dale. The following is the list of the papers set down for reading:—

"On Metal Mixers, as used at the Works of the North-Eastern Steel Company," by Mr. Arthur Cooper.

"On the Effect of Arsenic upon Steel," by Mr. J. E. Stead.

On the Iron Ore Mines of Elba," by Mr. H. Scott.

"On the Manufacture of Steel Projectiles in Russia," by Sergius Kern.

"On Ternary Alloys of Iron with Chromium, Molybdenum, and Tungsten," by James S. De Benneville, of Philadelphia.

The last two papers were taken as read. After the usual formal proceedings, the President presented the Bessemer medal, which had this year been awarded to Mr. H. M. Howe, of Boston, U.S.A. As Mr. Howe was not able to be present, Prof. Roberts-Austen accepted the medal on his behalf.

Mr. Dale next proceeded to read his inaugural address. Those who know the good work done by Mr. Dale in the conciliation of labour disputes will not be surprised to learn that the chief interest of the address was in the domain of economics rather than metallurgy. The address was none the less welcome on this account, as no class are more affected by disturbances in the labour market than the iron and steel makers. Mr. Dale showed very clearly the disastrous effects upon British trade of strikes and industrial disputes, and dwelt upon the ever-enlarging area of competition in the manufacturing markets of the world; for now we have not only the continental nations of Europe to contend with, but have to meet the products of the still cheaper labour of the far East.

Mr. Cooper's paper, though short, supplied a valuable contribution of knowledge to the practical steel maker. Uniformity of product is at once one of the most desirable and most difficult things for the steel maker to secure. No matter what care may be taken, the product of the blast furnace will vary in regard to those minute percentages of alloys which exercise so important an influence on the characteristics of the steel producer. Efforts have been made to equalise the analysis of the pig iron by mixing the ore, but these have been only partially successful. It is desirable, from an economic point of view, that molten iron should be taken direct from the blast furnace and used in the converter; but, in the basic process, the need of uniformity has prevented this course being followed. It has been therefore necessary to follow the original plan of running the molten iron from the blast furnace into pigs, and then remelting it in cupolas. In this way, by using the product of several furnaces, and by a system of careful analysing and selection, uniformity has been generally obtained. In spite of all care taken, however, there will be at times differences in the product of the cupolas, owing to irregularities in working which could not be guarded against, and it would frequently happen that though a standard mixture of pig might be charged into the cupola, the amount of silicon or manganese would vary considerably, owing to larger quantities of these metals being oxidised at one time than another. The mixer is a vessel in appearance like a large Bessemer converter. Into this the molten metal from the blast furnace is run, together with a certain amount of cupola iron in the case of the North Eastern Steel Company's works, with the plant of which the paper deals. The mixer is largely used in America, Mr. Carnegie stating during the discussion that at his works they were about to erect some of 600 tons capacity. The mixers, of which there are two at the North Eastern works, are each 150 tons capacity. For drawing the metal off into the ladle the mixer is tilted, swinging on trunnions like a converter, hydraulic machinery being provided for the purpose. In the discussion which followed the reading of the paper, many steel makers corroborated the account, given by the author, of the excellent results obtained by the use of the mixer.

The chief feature of the meeting was the reading and discussion of Mr. Stead's excellent contribution on the effect of arsenic in steel—a paper we should have described as exhaustive had it not been that the author states he is about to follow up the experiments of which he gives an account by further investigation in the same field. Mr. Stead commenced by a reference to the well-known memoir on the same subject, which Messrs. Harbord and Tucker contributed to the meeting of the Institute held in 1888. In that paper it was shown that a large quantity of arsenic is decidedly injurious to steel; and it has generally been thought that smaller quantities would be similarly injurious in a corresponding degree. Mr. Stead did not consider such an hypothesis necessarily sound, and determined to carry out the elaborate series of experiments, details of which are given in the paper. The results, as we have said, are of the utmost importance to steel makers, for arsenic and phosphorus are frequently bracketed in analyses, as the separation of the two is a long and tedious process. If small quantities of arsenic are not injurious, as would appear from Mr. Stead's investigations, phosphorus is undeniably a deleterious ingredient.

The general conclusions the author drew from his investigations were that between 0·10 per cent. and 0·15 per cent. of arsenic in steel for structural purposes does not have any material effect so far as mechanical properties are concerned. The tenacity is but slightly increased, the elongation is apparently not affected, and the reduction in area of the fractured test-pieces is practically equal to that of the same steel without the addition of arsenic. With 0·20 per cent. arsenic the difference, although slight, is noticeable in samples of acid open-hearth steel tried; but even in this case the only serious difference evidently caused by the arsenic is the inferiority of the bending properties of the pieces cut from the plates across the direction of rolling after they had been tempered. With larger amounts of arsenic the effect is decisive. When 1 per cent. is present the tenacity is increased, and the elongation slightly reduced. The bending properties of the steel are, however, fairly good. When the arsenic amounts to about $1\frac{1}{2}$ per cent. the tenacity is still further increased, and the elongation and contraction of area still further reduced, whilst the bending properties are poor. With 4 per cent. of arsenic the tenacity is increased, and the contraction becomes *nil*. The author points out, however, that the trials with steel containing the higher percentages of arsenic could not be considered quite satisfactory, because the ingots on which the experiments were made were of very small size, and consequently a small amount of work only could be put upon them before testing. Mr. Stead considered it would have been highly probable that had larger masses been dealt with the results would have been more satisfactory. The effect of quenching the steel, after heating to a red heat, in every case where arsenic was in large quantity, was to improve its bending property.

Hot working is not affected by even 4 per cent. of arsenic, such an alloy appearing to stand about as much heat without burning as a steel containing 1 per cent. of carbon. When heated below the burning point such material can readily be hammered and rolled, and appears to be as soft in that state as steel containing about ·05 per cent. carbon. From this the author considers it safe to conclude that arsenic has not the slightest tendency to produce red-shortness. Mr. Stead had made experiments to ascertain the rate of corrosion of arsenical steel. He had submerged wires in a 2 per cent. solution of sal-ammoniac, had placed others in fresh water, and still another sample to a pile of the wharf at the Middlesbrough Ironworks in such a position as to be alternately covered and exposed as the tide ebbed and flowed. The conclusions arrived at were that arsenical steel is not more liable to corrosion than the same material without arsenical addition; in fact, oxidation is retarded by the presence of small quantities of arsenic.

It is in steel that is to be used in positions where it will require to be welded that arsenic appears most injurious, for that process is rendered more difficult by even very small quantities of arsenic; so that, as Mr. Stead says, when welding material is required, arsenic should be most carefully avoided. In regard to electrical conductivity, too, arsenic is injurious, for the value of the material in this respect is materially reduced by even small quantities of arsenic. A quantity equal to 0·25 per cent. diminishes the conductivity by about 15 per cent.

The paper concludes with an appendix in which the author gives a method he has worked out in detail for determining the arsenic in iron ores, in steel, and in pig iron. It has been the general practice to precipitate the arsenic as sulphide or hydric sulphide from the distillate, and either weigh the pure sulphide after drying at 212° F. or to oxidise it in bromine and hydrochloric acid, and then precipitate the arsenic acid with ammonia and magnesia solution, and weigh the precipitate produced. This process, although accurate, is tedious and takes at least twenty-four hours to complete. Mr. Stead has found that if the distillation is conducted in a special manner the whole of the arsenic may be obtained in the distillate, unaccompanied with any traces of chloride of iron, and that if the hydrochloric acid is nearly neutralised with ammonia and finally completely neutralised with acid carbonate of soda, the arsenic can be determined volumetrically with a standard solution of iodine, using starch solution as an indicator.

Émil Fischer proposed the process of distillation with ferrous chloride and titration of the distillate with iodine solution; but, as the details are not given in "Crookes' Select Methods," Mr. Stead had to work them out for himself. These he gives in full in his paper, to which we must refer our readers, as it would take too much space to describe the process in full. Mr. Stead says that a more simple and accurate device for the determination of small quantities of arsenic it would, he thinks, be impossible to conceive.

The discussion of this paper, although of an interesting nature, did not produce any new facts of importance. The majority of those who spoke were either steel makers or those interested in the production of steel, and they naturally congratulated themselves on the conversion of a long-supposed enemy into a neutral, if not into an ally. It should be remembered, however, that the meeting consisted chiefly of persons only too anxious to reduce the difficulty and cost of steel making; and not likely to accept any explanations tending to that end in a captious spirit. No one is likely to question the scientific accuracy or *bona fides* of so eminent and conscientious an observer and experimentalist as Mr. Stead, yet there may be something to say on the other side. This appears more likely from the remarks of the one user of steel who spoke—Mr. Wigham, the manager of a wire-drawing firm—who had made a report to Mr. Stead, which was quoted in the paper. It should be remembered, also, that Mr Stead himself says that further experiments are necessary.

The only remaining paper that was read was Mr. Scott's contribution on the Iron Mines of Elba. This was not discussed.

The autumn meeting of the Institute will take place in Birmingham, commencing Tuesday, August 12.

THE SCHORLEMMER MEMORIAL LABORATORY.

AN interesting ceremony took place at the Owens College, Manchester, a few days ago, when Dr. Ludwig Mond formally opened the Schorlemmer Laboratory for Organic Chemistry, together with a large laboratory for medical students and a room for the preparation and storage of reagents. It may be remembered that, after the death of Prof. Schorlemmer, his friends and pupils, under the lead of Sir H. E. Roscoe, late professor of chemistry at the College, took steps with a view to fittingly commemorate his services to the College and to the advancement of organic chemistry. It was generally felt that the best memorial would be the erection of a laboratory for organic chemistry, to be called after his name, and a subscription list was accordingly opened. The appeal, which was generously headed by Dr. Mond, was so well responded to, both in this country and in Germany, that in a short time a sum of £2500 was subscribed. Meantime the Council of the College had to take into serious consideration the rapid growth of the chemical department. Originally designed for 100 students, the laboratories had for several years been overcrowded, and the private rooms built for research work had to be given up for the general instruction of the students. The number of the students in the chemical laboratories has steadily increased during the past five years, and, in view of this increase, the Council became convinced of the necessity of extending the chemical department. They accordingly accepted the fund raised by the Schorlemmer Memorial Committee, and instructed Mr. Alfred Waterhouse to prepare plans for a "Schorlemmer" Organic Laboratory, and for a new laboratory for elementary students, on a plot of land adjoining the present laboratories acquired by the College for the purpose of their extension. The Schorlemmer Laboratory, designed by Mr. Waterhouse, is at the end of the main corridor in the old chemical building. It measures sixty feet by thirty feet, and has an arched roof thirty feet high. The laboratory is designed to accommodate a professor, two demonstrators, and thirty-six students. It is fitted in the most complete manner with every requisite for the important work which is to be carried on within it, and in some particulars is arranged after the plan of the Munich organic laboratories. The lower laboratory is designed for forty-five students. The fittings are similar to those in the old laboratories designed by Sir Henry Roscoe. The total cost of the new building was £4800.

A full report of the opening ceremony is given in the *Manchester Guardian*, to which source we are indebted for the following condensed account:—

In connection with the inaugural proceedings, a large and representative company gathered in the Chemical Theatre of the College. Messages regretting inability to attend, and wishing prosperity to the laboratory, were received from a number of eminent chemists. Prof. H. B. Dixon referred to the esteem in which Schorlemmer's name was held, and expressed, on behalf of his colleagues and himself, their admiration of the life and character of the man to whose memory the laboratory had been erected.

Sir H. E. Roscoe sketched Schorlemmer's life, and, in the course of his address, said:—Schorlemmer added another name to the list of distinguished foreigners who had found a home in these islands. Never again could it be said that England failed to recognise and appreciate the value of the services of those who sought her shores. The names of Herschel, of Hofmann, of Max Müller, and, lastly, of Schorlemmer indicated that we are not slow to give honour to those who were once strangers in the land, but who had made themselves members of our national family. They might have good hopes that the time would soon come when the leaders in chemical industry would appreciate the necessity of a thorough scientific training, as had long been the case in Germany; and that as Giessen was, under Liebig, the means of raising the standard of chemical education throughout the Fatherland, so the chemical department of Owens College might, under the direction of Prof. Dixon and Prof. Perkin, the director of the new laboratory, be pointed out as the institution in England which had done the same for this great empire.

Dr. Ludwig Mond next addressed the meeting. He remarked that the opening of the first laboratory solely devoted to the study of organic chemistry, at the only University in England which could boast of a professor of that science, was a distinct step forward in the development of science in this country. He considered it a great step in advance to have a special laboratory and special professors appointed for the study of the chemistry of carbon, because the subject-matter of chemistry now covered so vast a domain, and was increasing at such an immense rate, that for any one desiring to further contribute to it, it had become a necessity, after mastering the main facts of the science, to give his attention specially to the details of one or other part of it. While it was true that carbon was only one out of many elements, it possessed such very special properties that the multitude of its compounds probably outnumbered those of all the rest of the elements together, and it had the unique interest that all the innumerable substances that were found in plants and animals, which built up their tissues, and by their constant changes produced the phenomenon we called life, were all